In the Claims:

Delete pending claims 1-24 and substitute the following claims 25-80 therefor.

25. (New Claim) A process for measuring a dimension of an elongated, generally cylindrically-shaped article, comprising:

a.   illuminating a portion of the article using a light source which casts a beam with nonplanar wavefront onto the article;

b.   receiving said nonplanar wavefront beam on a light sensor array, the article interposed between the array and the light source so that the beam and the article create a intensity pattern as received by the array, the intensity pattern corresponding to a dimension of the article;

c.   obtaining from said array a plurality of signals corresponding to light intensity at a plurality of locations in said intensity pattern on said array; and

d.   determining said dimension by evaluating information from said signals corresponding to light intensity at a plurality of locations in said intensity pattern in accordance with Fresnel diffraction theory, and according to the assumption that the wavefront from the light source is nonplanar; and

e.   wherein distances between the source, the article and the array are selected such that the intensity pattern in the vicinity of one shadow edge cast by the article on the array is at most negligibly superimposed on the intensity pattern in the vicinity of the other shadow edge cast by the article on the array.

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26. (New Claim) The process of claim 25 wherein evaluating information from said signals is accomplished using information that corresponds to a plurality of characteristic feature points in at least one diffraction pattern in the intensity pattern.

27. (New Claim) The process of claim 26 wherein said characteristic feature points are selected from a group comprising turning points, local centroids, local intensity maxima and local intensity minima in said at least one pattern.

28. (New Claim) The process of claim 25 wherein evaluating information from said signals is accomplished using information that corresponds to a gradient between predetermined characteristic feature points in at least one diffraction pattern in the intensity pattern.

29. (New Claim) The process of claim 25 wherein evaluating information from said signals is accomplished by comparing said information to information corresponding to a reference intensity pattern determined in accordance with Fresnel diffraction theory.

30. (New Claim) The process of claim 25 wherein evaluating information from said signals is accomplished by comparing said information to a plurality of reference intensity patterns determined in accordance with Fresnel diffraction theory.

31. (New Claim) The process of claim 25 wherein the dimension of the article is a diameter of an elongated article.

32. (New Claim) The process of claim 31 wherein the article is moving when its diameter is measured.

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33. (New Claim) The process of claim 25 wherein the light source produces monochromatic light.

34. (New Claim) The process of claim 26 wherein at least one contamination-reducing member is interposed between the article and at least one of the array and the light source, said at least one member selected from the group comprising electrostatic apertures, non-electrostatic apertures, compressed gas nozzles and transparent material.

35. (New Claim) The process of claim 25 wherein a transparent material is interposed between said article and at least one of said array and said light source.

36. (New Claim) The process of claim 25 wherein determination of said dimension takes into account the difference between the actual dimension of the article and the dimension of a shadow cast on the array by the article, the difference being caused at least in part by the beam having a nonplanar wavefront.

37. (New Claim) The process of claim 36 wherein determination taking into account said difference includes proportionally compensating for the distance of the article from a member selected from the group of the light source and the array.

38. (New Claim) . The process of claim 36 wherein said determination of said dimension includes compensating for the difference between (i) a dimension of the article that casts the shadow on the array and (ii) said dimension of the article that is actually desired to be determined.

39. (New Claim) The process of claim 25 using at least two light sources.

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40. (New Claim) The process of claim 25 using at least two light sources and two arrays.

41. (New Claim) The process of claim 25 using two light sources and two arrays, wherein the beams cast by the light sources are substantially perpendicular to each other.

42. (New Claim) The process of claim 41 wherein determination of said dimension relies upon a value corresponding to a distance between an array and the article, and said value is derived using information from said two arrays.

43. (New Claim) A process for measuring a diameter of an elongated article, comprising:

a. illuminating a portion of the article using a light source which casts a beam with nonplanar wavefront onto the article;

b. receiving said nonplanar wavefront beam on a light sensor array containing a plurality of elements, the article interposed between the array and the light source so that the beam and the article create a intensity pattern as received by the array, the intensity pattern corresponding to a dimension of the article that casts the intensity pattern on the array and the intensity pattern having at least two diffraction patterns;

c. obtaining from said array a plurality of signals, each signal corresponding to light intensity from said beam at the location of an element on said array;

d. determining the distance between the article and a member selected from the group of the light source and the array;

e.   determining said dimension by evaluating (a) information corresponding to said distance and (b) information from said signals corresponding to light intensity at a plurality of locations in said intensity pattern in accordance with Fresnel diffraction theory, and according to the assumption that the wavefront from the light source is nonplanar;

f.   in the process of said determination of said diameter, compensating for the difference between (i) said dimension that casts the intensity pattern on the array and (ii) the diameter of the article; and

g.   wherein distances between the source, the article and the array are selected such that the intensity pattern in the vicinity of one shadow edge cast by the article on the array is at most negligibly superimposed on the intensity pattern in the vicinity of the other shadow edge cast by the article on the array.

44.   (New Claim) The process of claim 43 wherein evaluating information from said signals is accomplished using information that corresponds to a plurality of characteristic feature points in at least one diffraction pattern in the intensity pattern.

45.   (New Claim) The process of claim 44 wherein said characteristic feature points are selected from a group comprising turning points, local centroids, local intensity maxima and local intensity minima in said at least one pattern.

46.   (New Claim) The process of claim 43 wherein evaluating information from said signals is accomplished using information that corresponds to a gradient between predetermined characteristic feature points in at least one diffraction pattern in the intensity pattern.

47. (New Claim) The process of claim 19 wherein evaluating information from said signals is accomplished by comparing said information to information corresponding to a reference intensity pattern determined in accordance with Fresnel diffraction theory.

48. (New Claim) The process of claim 19 wherein evaluating information from said signals is accomplished by comparing said information to a plurality of reference intensity patterns determined in accordance with Fresnel diffraction theory.

49. (New Claim) A process for measuring a dimension of an article, comprising;

a. illuminating a portion of the article using a first light source which casts a first beam with a nonplanar wavefront onto the article;

b. receiving said first beam on a first light sensor array containing a plurality of elements, the article interposed between the first array and the first light source so that the first beam and the article create a first intensity pattern as received by the first array, the first intensity pattern corresponding to the dimension of the article;

c. obtaining from a plurality of elements in said first array a set of first signals corresponding to light intensity from said first beam at a plurality of locations in said first intensity pattern on said first array;

d. illuminating a portion of the article using a second light source which casts a second beam with a nonplanar wavefront onto the article;

e. receiving said second beam on a second light sensor array containing a plurality of elements, the article interposed between the second array and the

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second light source so that the second beam and the article create a second

intensity pattern as received by the second array, the second intensity pattern also

corresponding to the dimension of the article;

f.   obtaining from a plurality of elements in said second array a set of second

signals corresponding to light intensity from said second beam at a plurality of

locations in said second intensity pattern on said second array; and

g.   determining said dimension by evaluating information from at least one of said

first and second sets of signals corresponding to light intensity at a plurality of

locations in said first and second intensity patterns in accordance with Fresnel

diffraction theory the determination conducted according to the assumption that the

wavefront from the light source is nonplanar;

h.   wherein determination of said dimension takes into account the difference

between the actual dimension of the article and the dimension of a shadow cast on

at least one array by the article, the difference being caused at least in part by the

beam having a nonplanar wavefront.

50.   (New Claim) The process of claim 49 wherein evaluating information from

said signals is accomplished using information that corresponds to a plurality of

characteristic feature points in at least one diffraction pattern in at least one of said

intensity patterns.

54.   (New Claim) The process of claim 50 wherein said characteristic feature

points are selected from a group comprising turning points, local centroids, local

intensity maxima and local intensity minima in said at least one pattern.

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52. (New Claim) The process of claim 49 wherein evaluating information from said signals is accomplished using information that corresponds to a gradient between predetermined characteristic feature points in at least one diffraction pattern in at least one of the intensity patterns.

53. (New Claim) The process of claim 49 wherein evaluating information from said signals is accomplished by comparing said information to information corresponding to a reference intensity pattern determined in accordance with Fresnel diffraction theory.

54. (New Claim) The process of claim 49 wherein evaluating information from said signals is accomplished by comparing said information to a plurality of reference intensity patterns determined in accordance with Fresnel diffraction theory.

55. (New Claim) The process of claim 49 wherein the dimension is a diameter and wherein the article is moving when its diameter is measured.

56. (New Claim) The process of claim 49 wherein the light sources produce monochromatic light.

57. (New Claim) The process of claim 49 wherein at least one contamination-reducing member is interposed between the article and at least one of the array and the light source, said at least one member selected from the group comprising electrostatic devices, non-electrostatic apertures, compressed gas nozzles, creation of an overpressure and transparent material.

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58.   (New Claim) The process of claim 49 wherein transparent material is interposed between said article and at least one of said array and said light source.

59.   (New Claim) The process of claim 49 wherein said determination of said dimension takes into account distance of the article relative to at least one member selected from the group comprising said light sources and said arrays, and wherein information corresponding to said distance is determined from at least one of said first and second sets of signals.

60.   (New Claim) The process of claim 59 wherein said determination of said dimension relies upon a value corresponding to a distance between an array and the article.

61.   (New Claim) The process of claim 49 wherein distances between the sources, the article and the arrays are selected such that the intensity patterns in the vicinity of one shadow edge cast by the article on each array is at most negligibly superimposed on the intensity pattern in the vicinity of the other shadow edge cast by the article on the array.

62.   (New Claim) The process of claim 49 wherein said determination of said dimension includes compensating for the difference between (i) a dimension of the article that casts the shadow on the array and (ii) said dimension of the article that is actually desired to be determined.

63.   (New Claim) A process for measuring a dimension of an elongated, generally cylindrically-shaped article, comprising:

a.   illuminating a portion of the article using a light source which casts a beam with nonplanar wavefront onto the article;

b.   receiving said nonplanar wavefront beam on a light sensor array, the article interposed between the array and the light source so that the beam and the article create a intensity pattern as received by the array, the intensity pattern corresponding to a dimension of the article;

c.   obtaining from said array a plurality of signals corresponding to light intensity at a plurality of locations in said intensity pattern on said array; and

d.   determining said dimension by evaluating information from said signals corresponding to light intensity at a plurality of locations in said intensity pattern in accordance with Fresnel diffraction theory, and according to the assumption that the wavefront from the light source is nonplanar; and

e.   filtering said signals corresponding to light intensity at a plurality of locations in said intensity pattern in order to attenuate effects of dirt.

64.   (New Claim) The process of claim 63 wherein evaluating information from said signals is accomplished using information that corresponds to a plurality of characteristic feature points in at least one diffraction pattern in the intensity pattern.

65.   (New Claim) The process of claim 64 wherein said characteristic feature points are selected from a group comprising turning points, local centroids, local intensity maxima and local intensity minima in said at least one pattern.

66.   (New Claim) The process of claim 63 wherein evaluating information from said signals is accomplished using information that corresponds to a gradient

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between predetermined characteristic feature points in at least one diffraction

pattern in the intensity pattern.

67. (New Claim) The process of claim 63 wherein evaluating information from

said signals is accomplished by comparing said information to information

corresponding to a reference intensity pattern determined in accordance with

Fresnel diffraction theory.

68. (New Claim) The process of claim 63 wherein evaluating information from

said signals is accomplished by comparing said information to a plurality of

reference intensity patterns determined in accordance with Fresnel diffraction

theory.

69. (New Claim) The process of claim 63 wherein the dimension of the article is a

diameter of an elongated article.

70. (New Claim) The process of claim 69 wherein the article is moving when its

diameter is measured.

71. (New Claim) The process of claim 63 wherein the light source produces

monochromatic light.

72. (New Claim) The process of claim 63 wherein at least one contamination-

reducing member is interposed between the article and at least one of the array and

the light source, said at least one member selected from the group comprising

electrostatic apertures, non-electrostatic apertures, compressed gas nozzles and

transparent material.

73. (New Claim) The process of claim 63 wherein a transparent material is interposed between said article and at least one of said array and said light source.

74. (New Claim) The process of claim 63 wherein determination of said dimension takes into account the difference between the actual dimension of the article and the dimension of a shadow cast on the array by the article, the difference being caused at least in part by the beam having a nonplanar wavefront.

75. (New Claim) The process of claim 74 wherein determination taking into account said difference includes proportionally compensating for the distance of the article from a member selected from the group of the light source and the array.

76. (New Claim). The process of claim 74 wherein said determination of said dimension includes compensating for the difference between (i) a dimension of the article that casts the shadow on the array and (ii) said dimension of the article that is actually desired to be determined.

77. (New Claim) The process of claim 63 using at least two light sources.

78. (New Claim) The process of claim 63 using at least two light sources and two arrays.

79. (New Claim) The process of claim 63 using two light sources and two arrays, wherein the beams cast by the light sources are substantially perpendicular to each other.

80. (New Claim) The process of claim 79 wherein determination of said dimension relies upon a value corresponding to a distance between an array and the article, and said value is derived using information from said two arrays.